What is claimed is:

1. A method for analyzing a sample of wafers, comprising the steps of:

(a) identifying F failure metrics that are applicable to at least one circuit pattern on each wafer within the sample of wafers, where F is an integer;

(b) identifying Z spatial and/or reticle zones on each wafer, where Z is an integer;

(c) providing values for each of the F failure metrics, for each of the Z zones on each wafer;

(d) defining a point for each respective wafer in an N-dimensional space, where N=F*Z, and each point has coordinates corresponding to values of the F failure metrics in each of the Z zones of the corresponding wafer; and

(e) clustering the sample of wafers into a plurality of clusters of wafers, so that the wafers within each cluster are close to each other in the N-dimensional space, thereby identifying the plurality of clusters of wafers from the sample of wafers so that within each individual cluster, the wafers have a similar distribution of defects.

2. The method of claim 1, wherein step (c) includes extracting the values from failure bit map data, multi-probe data or final die sort data collected from each wafer, using a die sort tester.

3. The method of claim 1, wherein:

step (b) includes identifying Z reticle zones, corresponding to Z zones within a reticle used to make each wafer,

each wafer has E reticle fields corresponding to E exposures of the wafer using the reticle, and

step (c) includes providing, for each wafer, Z values for each failure metric, each of the Z values representing a combined measure of the values of that failure metric for a given one of the reticle zones across all E reticle fields of that wafer.

4. The method of claim 3, wherein the D reticle zones correspond to D die within each reticle field.

5. The method of claim 1, wherein:

S spatial zones and R reticle zones are identified on each wafer, where R and S are integers,

steps (c), (d) and (e) are performed with Z=S, using spatial data from the S spatial zones, and

steps (c), (d) and (e) are performed with Z=R, using reticle data from the R reticle zones.

6. The method of claim 1, further comprising after step (d), filtering the data to eliminate noise.

7. The method of claim 1, further comprising after step (d),

performing a principle component analysis on the coordinates for each point to identify a set of principle component scores;

identifying insignificant principal component scores; and

eliminating the insignificant principal component scores before step (e).

8. The method of claim 7, wherein step (e) includes:

initially assigning each wafer to a respectively different cluster;

determining a respective distance between each pair of the clusters in a principle component space; and

recursively combining into a single cluster the pair of clusters that are separated by a smallest distance in the principle component space.

9. The method of claim 7, wherein step (e) includes agglomerative hierarchical clustering.

10. The method of claim 9, wherein a distance between a given two of the clusters is defined as the greatest distance, in the N-dimensional space, between any two wafers in the given two clusters, and the agglomerative hierarchical clustering includes combining wafers of the clusters until the smallest distance between any two of the clusters exceeds a predetermined threshold.

11. The method of claim 8, wherein the distance between a pair of clusters is defined as the greatest distance between any two points corresponding to any of the wafers in the pair of clusters.

12. The method of claim 1, wherein step (e) comprises:

(e1) initially assigning a subset of the wafers to one of the clusters;

(e2) determining a respective distance between the point corresponding to each of the subset of wafers and a centroid of the one cluster;

(e3) calculating a first sum of the squared errors from the distances of step (e2);

(e4) calculating a second sum of the squared errors that is obtained from each of two partitioned clusters to be formed by partitioning the one cluster, where the second sum of the squared errors is based on the respective distance between each point and a centroid of the respective partitioned cluster to which that point is to be assigned;

(e5) partitioning the one cluster into the two partitioned clusters, if the second sum of the squared errors is significantly less than the first sum of the squared errors.

13. The method of claim 12, wherein step (e5) comprises partitioning the one cluster into the two partitioned clusters, if one minus a ratio of the second sum of the squared errors divided by the first sum of the squared errors exceeds a threshold value.

14. The method of claim 1, further comprising performing a commonality analysis to identify one or more pieces of equipment responsible for a lot of wafers having a yield below a desired yield.

15. The method of claim 14, wherein the commonality analysis includes a Monte Carlo simulation.

16. The method of claim 14, wherein the commonality analysis includes analysis of variance between lots of wafers.

AMENDED CLAIMS

[received by the International Bureau on 04 August 2004 (04.08.04); claim 1 amended]

1. A method for analyzing a sample of wafers, comprising the steps of:

(a) identifying F failure metrics that are applicable to at least one circuit pattern on each wafer within the sample of wafers, where F is an integer;

(b) identifying Z spatial and/or reticle zones on each wafer, where Z is an integer;

(c) providing values for each of the F failure metrics, for each of the Z zones on each wafer;

(d) defining a point for each respective wafer in an N-dimensional space, where N=F*Z, and each point has coordinates corresponding to values of the F failure metrics in each of the Z zones of the corresponding wafer; and

(e) clustering the sample of wafers into a plurality of clusters of wafers using a computer, so that the wafers within each cluster are close to each other in the N-dimensional space, thereby identifying the plurality of clusters of wafers from the sample of wafers so that within each individual cluster, the wafers have a similar distribution of defects.

2. The method of claim 1, wherein step (c) includes extracting the values from failure bit map data, multi-probe data or final die sort data collected from each wafer, using a die sort tester.

3. The method of claim 1, wherein:

step (b) includes identifying Z reticle zones, corresponding to Z zones within a reticle used to make each wafer,

each wafer has E reticle fields corresponding to E exposures of the wafer using the reticle, and

step (c) includes providing, for each wafer, Z values for each failure metric, each of the Z values representing a combined measure of the values of that failure metric for a given one of the reticle zones across all E reticle fields of that wafer.

4. The method of claim 3, wherein the D reticle zones correspond to D die within each reticle field.

5. The method of claim 1, wherein: